CLAIMS

1. A packet and optical routing equipment (2; 200), comprising:

- optical input means (10a1, 10a2; 10a) suitable for receiving input multiplexed signals;

- optical output means (10b1, 10b2; 10b) suitable for supplying output multiplexed signals;

- a non-packet optical port (21) suitable for exchanging branch non-packet signals;

- a packet optical port (22) suitable for exchanging branch packet signals;

- an optical forwarding and multiplexing stage (10) coupled between said optical input (10a1, 10a2; 10a) and said optical output (10b1, 10b2; 10b);

- a packet forwarding stage (15, 20) connected between said optical packet port (22) and said optical forwarding and multiplexing stage (10);

characterized by:

- a non-packet optical/electric converter (14) connected to said non-packet optical port (21) and suitable for converting said branch non-packet signals into and from non-packet electric signals;

- a packet optical/electric converter (16) connected between said optical packet port (22) and said packet forwarding stage (15, 20), said packet optical/electric converter (16) being suitable for converting said branch packet signals into and from electric packet signals exchanged with said packet forwarding stage (15, 20);

- an electric switching unit (13), connected to said non-packet optical/electric converter (14) and said packet forwarding stage (15, 20) for exchanging therewith said electric non-packet and packet signals; and

- an interface converter (12) coupled between said electric switching unit (13) and said optical forwarding and multiplexing stage (10) for converting said electric

non-packet and packet signals into and from optical signals supplied to and from said optical forwarding and multiplexing stage (10).

2. The equipment according to claim 1, wherein said electric switching unit (13) has a first plurality of input/outputs (18a) connected to said non-packet optical/electric converter (14), a second plurality of input/outputs (18b) connected to said packet forwarding stage (15, 20) and a third plurality of input/outputs (19) connected to said interface converter (12), said electric switching unit (13) being configured to connect a variable number of input/outputs (18a, 18b) of said first and second plurality to said third plurality of input/outputs (19).

3. The equipment according to claim 1 or 2, wherein said optical input means comprises a first and a second input (10a1, 10a2) and said optical output means comprises a first and a second output (10b1, 10b2); said optical forwarding and multiplexing stage (10) comprising a first set of cascade-connected optical add/drop multiplexers (27) and a second set of cascade-connected optical add/drop multiplexers (27).

4. The equipment according to claim 3, wherein said first set of optical add/drop multiplexers (27) is coupled between said first input (10a1) and said first output (10b1) and said second set of optical add/drop multiplexers (27) is coupled between said second input (10a2) and said second output (10b2).

5. The equipment according to any of claims 3-4, wherein said optical add/drop multiplexers (27) are of a tunable type.

6. The equipment according to any of claims 3-5, wherein said interface converter (12) comprises a plurality of transceivers (28), each transceiver (28) being connected to a respective one of said optical add/drop multiplexers (27).

7. The equipment according to claim 6, wherein each said transceiver (28) comprises a transmitter laser of tunable type, a gray receiver and an electronic unit.

8. The equipment according to any of claims 1-7, wherein said packet forwarding stage (15, 20) comprises a packet forwarding module (15), coupled between said electric switching unit (13) and said packet optical/electric converter (16), and a packet and optical control plane (20), suitable for generating control signals for said optical input and output means, said optical forwarding and multiplexing stage (10), said interface converter (12), said electric switching unit (13) and said non-packet and packet optical/electric converters (14, 16).

9. The equipment according to claim 8, wherein said optical input and output means comprise channel termination units (31) suitable for extracting and/or adding control signals having a different wavelength with respect to said input and output multiplexed signals.

10. The equipment according to claim 9, wherein said channel termination units (31) are connected with said packet forwarding module (15)for exchanging said control signals therewith.

11. The equipment according to any of claims 8-10, wherein said packet and optical control plane (20) is

suitable for generating control signals for said optical forwarding and multiplexing stage (10) and wherein said optical forwarding and multiplexing stage (10) is configured to route first selected of said input multiplexed signals toward said optical output means (10b1, 10b2; 10b), to extract second selected of said input multiplexed signals toward said interface converter (12) and to add said optical signals to said output multiplexed signals.

12. The equipment according to claim 1 or 2, wherein said optical input means comprises a plurality of inputs (10a) and said optical output means comprises a plurality of outputs (10b) and wherein said optical forwarding and multiplexing stage (10) comprises an optical switching unit (202) connected to said interface converter (12) and a multiplexing/demultiplexing unit (201) connected between said optical switching unit (202) and said inputs and outputs.

13. An optical network of wavelength multiplexing type, comprising a plurality of packet and optical routing equipment (2; 200) and a plurality of optical connections (3) extending between pairs of packet and optical routing equipment (2; 200), each said packet and optical routing equipment (2; 200) comprising:

- optical input means (10a1, 10a2; 10a) connected to a first of said optical connections (3) and receiving input multiplexed signals;
- optical output means (10b1, 10b2; 10b) connected to a second of said optical connections (3) and supplying output multiplexed signals;
- a non-packet optical port (21) exchanging branch non-packet signals;
- a packet optical port (22) exchanging branch packet signals;

- optical forwarding and multiplexing stage (10) coupled between said optical input means (10a1, 10a2; 10a) and said optical output means (10b1, 10b2; 10b);
- a packet forwarding stage (15, 20) connected between said optical packet port (21) and said optical forwarding and multiplexing stage (10);
characterized in that each said packet and optical routing equipment (2; 200) comprises:
- a non-packet optical/electric converter (14) connected to said non-packet optical port (21) and converting said branch non-packet signals into and from non-packet electrical signals;
- a packet optical/electric converter (16) connected between said optical packet port and said packet forwarding stage (15, 20), said packet optical/electric converter (16) converting said branch packet signals into and from electric packet signals exchanged with said packet forwarding stage (15, 20);
- an electric switching unit (13) connected to said non-packet optical/electric converter (14) and said packet forwarding stage (15, 20) for exchanging therewith said electric non-packet and packet signals; and
- an interface converter (12) coupled between said electric switching unit (13) and said optical forwarding and multiplexing stage (10) for converting said electric non-packet and packet signals into and from optical signals supplied to and from said optical forwarding and multiplexing stage (10).

14. A method for packet and optical signal routing, comprising the steps of:
receiving input multiplexed optical signals;
receiving branch non-packet optical signals;
receiving branch packet optical signals;
forwarding first selected of said input multiplexed

optical signals as output multiplexed optical signals, extracting second selected of said input multiplexed optical signals and adding said branch non-packet and packet optical signals to said output multiplexed optical signals;

characterized in that said step of adding said branch non-packet and packet optical signals to said output multiplexed optical signals comprises:

converting said received branch non-packet and packet optical signals into non-packet and packet electric signals;

switching said non-packet and packet electric signals according to available resources;

converting the switched non-packet and packet electric signals into optical signals; and

adding said optical signal to said output multiplexed signals.

15. The method according to claim 14, further comprising the steps of converting said second selected of said input multiplexed signals into extracted electric signals; switching said extracted electric signals to obtain first and second electric signals; converting said first electric signals into branch non-packet optical signals; sending said branch non-packet optical signals to a non-packet destination; converting said second electric signals into branch packet optical signals; and routing said branch packet optical signals toward a packet destination.

16. The method according to claim 14 or 15, comprising the step of:

- generating control signals in a first packet and optical routing equipment;

- transmitting said control signals onto a first optical

connection line;

- receiving said control signals at a second packet and optical routing equipment;

- checking the destination of said control signals at a second packet and optical routing equipment and, if said second packet and optical routing equipment is not a destination equipment,

  - routing said control signals onto a second optical connection line toward a further packet and optical routing equipment and
  - repeating the previous step at the further packet and optical routing equipment until a destination packet and optical routing equipment for the control signals is reached, so as to establish a path for said control signals including the packet and optical routing pieces of equipment between said first and said destination packet and optical routing equipment;

- checking a traffic condition to detect a low or high traffic condition for said branch packet signals;

- in case of low traffic condition, implementing a base connectivity for said branch packet optical signals including the packet and optical routing pieces of equipment between said first and said destination packet and optical routing equipment;

- in case of high traffic condition, implementing a direct connectivity for said branch packet optical signals between said first and said destination packet and optical routing equipment.

17. The method according to claim 16, wherein said step of implementing a base connectivity comprises transmitting said branch packet optical signals together with said control signals from said first to said destination packet and optical routing equipment.